

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

Staff Report for Item No. 10.b.

Tentative Order No. R9-2003-0002

General Waste Discharge Requirements for
Post-Closure Maintenance and Monitoring for
Inactive Landfills Containing Insignificant
Volumes of Decomposable Wastes within the
San Diego Region

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March 12, 2003

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1. INTRODUCTION

The General Waste Discharge Requirements (WDRs) in tentative Order No. R9-2003-0002 apply specifically to inactive, nonhazardous solid waste landfills (former Class II-2 and Class III landfills and burn dumps) which contain insignificant volumes of decomposable wastes but require ongoing site monitoring and maintenance of best management practices (BMPs).

Table 1. Identification of Dischargers

Inactive Landfill	Discharger	Rationale for Identification
Admiral Baker Landfill	U.S. Navy	Owner and operator
Old Spanish Bight Landfill	U.S. Navy	Owner and operator.
Cactus Park Landfill	County of San Diego	Owner and operator
Rainbow Canyon Landfill	333 Trust - Rupinder Uppal and Sudeep Dhillon Trustees	Current owner
San Pasqual Academy Landfill	County of San Diego	Current owner

2. BACKGROUND

A. Statewide Solid Waste Assessment Tests (SWAT) Program.

In 1984, the State Legislature passed a law requiring the testing of water and air media at all solid waste disposal sites (Chapter 15, Statutes of 1984). The law added Section 13273 to the California Water Code, and requires the SWRCB to rank all solid waste disposal sites into groups of 150 each, based upon their probable threat to water quality. The law requires that the dischargers (owners/operators) of each of the 150 sites in a given rank submit a water quality Solid Waste Assessment Test (SWAT) report. The Regional Boards statewide reviewed the reports to determine whether the sites were leaking and needed to take remedial action. The results are as follows:

The Regional Boards approved a total of 528 reports or exemption questionnaires (for sites with undetermined leak status) in all ranks and waived a total of 16 reports from sites already known to leak. These 544 sites were mainly from the lower ranks and therefore estimated to be the sites most likely to have leaked hazardous wastes into the waters of the State. Of these 544 sites,

- 392 sites (72%) were found to have leaked waste constituents from the WMU.
- 33 of the 544 sites (6%) were classified as leaking wastes at concentrations exceeding hazardous levels.
- 276 of the 544 sites (51%) were determined to be leaking waste constituents above other “regulatory levels”.
- 83 of the 544 sites (15%) were determined to be leaking waste constituents above background levels, but below any applicable “regulatory levels”.
- 76 of the 544 sites (14%) were not known to be leaking.
- 76 of the 544 sites (14%) are undetermined with regard to their leakage status, in many cases because background water quality cannot be determined.

The percentage of SWAT sites found to be leaking outside the limits of the landfill is between 72% (if all 76 “undetermined” sites are actually not leaking) and 86% (if all 76 “undetermined” sites are actually leaking). Over half of the landfills closed longer than 30 years leaked in excess of “beneficial uses” criteria (SWRCB, 2003).

Available SWAT Reports for facilities located in the San Diego Region are generally consistent with findings of the statewide SWAT program. The Regional Board staff concludes that the closed, abandoned, or inactive (CAI) landfills that do not have SWAT results are also likely to be consistent with the results from the statewide SWAT program.

B. Essential Characteristics and Composition of Municipal Solid Wastes (MSW).

Leakage of waste constituents from MSW landfills into groundwater may occur through the migration of soluble waste constituents in “liquids” (AKA leachate) or from the migration of volatile waste constituents from the generation of landfill gas.

The ability of solid wastes to generate leachate is related to physical and chemical properties of the solid waste. According to Tchobanglous *et al.* (1993), the physical and chemical properties of MSW include:

1. Moisture content – different types of solid waste contain inherently different concentrations of moisture (e.g., agricultural wastes = 40 to 90% moisture, scrap metal 0 to 5% moisture by weight).
2. Field capacity – is the total amount of moisture that can be retained by a waste

sample under the pull of gravity. The field capacity is of critical importance in determining the formation of leachate in landfills. Water in excess of field capacity will be released as leachate.

3. Proximate analysis – proximate analysis measures the combustible components of municipal solid waste (MSW) and includes the following parameters:
 - a. Moisture content (loss of moisture when heated to 105°C for 1 hour)
 - b. Volatile combustible matter (additional weight loss on ignition at 950°C in a covered crucible.
 - c. Fixed carbon - combustible residue left after volatile matter is removed.
 - d. Ash (weight of residue after combustion in an open crucible).
 - e. Fusing point of ash – temperature at which the ash resulting from burning of the waste will form a solid (clinker) by fusion and agglomeration. Typical fusing temperatures for MSW range from 2000 to 2200 °F (1100 to 1200 °C).

Table 1 - Typical Results from Proximate Analysis of Modern MSW

Type of Waste	Moisture	Volatile Matter	Fixed Carbon	Non-combustible (ash)
Food Products	2 to 79	16 to 95	2 to 4	0.2 to 5
Paper Products	4 to 10	66 to 91	5 to 12	1 to 23
Plastics	0.2	87 to 99	<0.1 to 11	0.5 to 4
Textiles (rubber, leather)	1 to 10	66 to 84	5 to 18	6 to 9
Wood wastes	12 to 60	30 to 75	9 to 12	0.4 to 0.6
Glass/metals	2 to 5	N/A		96 to 99

Units = % by weight of material

4. Ultimate analysis – typically involves the determination of the percent carbon (C), hydrogen (H), oxygen (O), nitrogen (N), sulfur (S), and ash.
Determination of halogens (chlorinated compounds) may also be included in this analysis. These results are often used to characterize the organic matter in MSW. They can also be used to assess the mix of waste materials that may be necessary to achieve a suitable C/N ratio for biological conversion processes.

Table 2 - Typical Results from Ultimate Analysis of Modern MSW

Type of Waste	Carbon	Hydrogen	Nitrogen	Sulfur	Ash
Food Products	60 to 73	6 to 12	0.4 to 3	0.1 to 0.4	0.2 to 5
Paper Products	33 to 59	6 to 9	<0.1 to 0.3	0.1 to 0.2	1 to 23
Plastics	45 to 87	6 to 14	<0.1 to 6	<0.1 to 0.1	0.3 to 10
Textiles (rubber, leather)	48 to 70	6 to 9	2 to 10	0.2 to 1.6	3 to 20
Wood wastes	46 to 50	6	0.1 to 3.4	<0.1 to 0.3	0.4 to 6
Glass/metals	0.5 to 5	0.1 to 0.6	<0.1	N/A	90 to 98

Units = % by weight of material

C. Composition of Landfill Gas from Municipal Solid Wastes (MSW).

Landfill gases are composed of a number of gases that are present in large amounts (the principal gases) and a number of gases present in very small amounts (trace gases).

The principal gases are produced from the decomposition of the organic fraction of MSW. These gases include ammonia (NH₃), carbon dioxide (CO₂), carbon monoxide (CO), hydrogen (H₂), hydrogen sulfide (H₂S), methane (CH₄), nitrogen (N₂), and oxygen (O₂). The typical percent distribution of gases found in MSW landfills is reported below:

Table 3- Composition of Typical Landfill Gas

Constituent/Gas	Percent (dry volume basis)
Methane	45 to 60
Carbon dioxide	40 to 60
Nitrogen	2 to 5
Oxygen	0.1 to 1
Sulfides, disulfides, mercaptans	0 to 1
Ammonia	0.1 to 1
Hydrogen	0 to 0.2
Carbon monoxide	0 to 0.2
Trace constituents	0.01 to 0.6

Methane and carbon dioxide are the principal gases produced from the anaerobic decomposition of biodegradable organic waste components in MSW. The presence of carbon dioxide can affect the pH of leachate produced within the landfill.

According to Tchobanoglous *et al.* (1993), the generation of landfill gas containing decomposable wastes can be expected to pass through several phases, including:

- a. Initial adjustment (Phase 1) – organic and biodegradable components undergo microbial decomposition under localized aerobic (using oxygen) or anerobic (absence of oxygen) conditions.
- b. Transition Phase (Phase 2) – oxygen is depleted and anaerobic conditions begin to develop within large areas of the landfill. Nitrate and sulfate are reduced to nitrogen gas and hydrogen sulfide gas. The oxidation-reduction potential of the values drop to –150 to –300 millivolts. The microbial community begins to convert complex organic material to organic acids and other intermediate products. If any leachate is formed the pH begins to drop due to the precense of organic acids and the presence of CO₂ in the landfill.
- c. Acid Phase (Phase 3) – the microbial activity produces significant amounts of organic acids and lesser amounts of hydrogen gas. Acidogenesis proceeds as microbial community converts the decomposition products into lower molecular mass compounds typified by acetic acid, and small concentrations of fulvic and other more complex organic acids. Carbon dioxide is the the principal gas generated during this phase. The leachate (if present) may drop to a pH of 5 or lower because of the presence of organic acids and elevated concentrations of CO₂. In the presence of leachate with a low pH, a number of inorganic constituents, principally heavy metals, will go into solution (leachate).

- d. Methane Fermentation Phase (Phase 4) – a second group of microorganisms convert the acetic acid and hydrogen gas to methane (CH₄) and CO₂. The pH of the leachate begins to rise (*e.g.*, to 6.8 to 8) as the acids and hydrogen gas is converted to CH₄ and CO₂. The soluble concentration of heavy metals in the leachate is reduced with the rise in pH.
- e. Maturation Phase (Phase 5) – occurs after the readily available biodegradable organic material has been converted to CH₄ and CO₂. The rate of landfill gas generation decreases significantly during this phase because most of the available nutrients have been removed with the leachate during the previous phases and the remaining substrates in the landfill are slowly biodegradable. Principal landfill gases are CH₄ and CO₂ though small amounts of nitrogen and oxygen may also be present. During this phase the landfill leachate will contain humic and fulvic acids which are difficult to process further through biological reactions.

D. Effects of Burning Upon Municipal Solid Wastes (MSW).

The characteristics of MSW may be significantly modified where the MSW has been burned prior to burial in the landfill. The process of burning the wastes may be expected to result in reducing the moisture content of the wastes and/or destroying volatile (*e.g.*, organic) waste constituents. Depending upon the nature of the wastes, and effectiveness of the combustion process, the residual solid material can be expected to contain lower concentrations of moisture and organic materials that are essential precursors to processes normally associated with the formation of leachate and landfill gas generation as described above.

According to Tchobanoglous *et al.* (1993), solid residuals from modern thermal treatment/conversions of MSW is referred to as “*Bottom ash.*” This solid residue from the combustion process contains the unburned and nonburnable portion of MSW. Bottom ash may contain considerable amounts of metals, glass, and unburned organic materials. It is well known that ash from MSW combustion contains trace concentrations of heavy metals and trace organic materials. Therefore solid residuals must be carefully managed to protect the public from contact with these materials. These observations are consistent with the observations and experiences of the Regional Board staff in regulating sites containing residual wastes (“*burn-ash*”) from former waste burning operations in the San Diego Region.

3. EVALUATION OF THREATS TO WATER QUALITY FROM SOLID WASTE UNITS CONTAINING INSIGNIFICANT VOLUMES OF DECOMPOSABLE WASTES

Landfills that do not contain significant quantities of decomposable waste, including those historically operated by open burning of refuse, may impact water quality. In some cases, these sites may contain “hazardous wastes” under the criteria of CCR Title 22 (Division 4.5). The residual wastes often contain waste constituents that may become solublized into leachate and migrate to groundwater under “*acidic*” conditions.

In the absence of a determination by the Department of Toxic Substances Control (DTSC) or certification of the wastes as hazardous by the discharger (pursuant to CCR Title 22); the Regional Board staff consider these wastes to generally meet the criteria for classification as “designated wastes”, pursuant to California Water Code (CWC) Section 13173, in terms of their threat to water quality. However, the experience of the Regional Board staff has been that most historical discharges of burn-ash wastes do not appear to present large threats to groundwater quality, or generate significant quantities of leachate, under normal ambient conditions encountered in the San Diego Region. A condition of pollution or nuisance is more likely to result from erosion of wastes that are exposed or inadequately covered at the landfill. Surface water quality objectives may be exceeded in cases of extreme erosion of the landfill surfaces.

Releases of degradation products and/or waste constituents from unlined, pre-1984 landfills not containing significant volumes of decomposable wastes may degrade water quality or cause minor impairment of beneficial uses of water resources. As a result of the considerations described above and the other information discussed in this Staff Report, the Regional Board staff recommends that the Regional Board continue to assign pre-1984, unlined MSW landfills with threat to water quality and complexity and complexity (TTWQ/CPLX) ranking of “3-C.”

The TTWQ/CPLX ranking of “3-C” is based upon the following considerations as outlined in CCR Title 23, Division 3, Section 2200 *et seq.*:

TTWQ: Category “3” – Those discharges of waste that could degrade water quality without violating water quality objectives, or could cause a minor impairment of designated beneficial uses as compared with Category 1 and Category 2.

CPLX: Category “C” - Any discharge for which waste discharge requirements have been prescribed pursuant to Section 13263 of the Water Code not included in Category “A” or Category “B”... Included would be discharges having no waste treatment systems or that must comply with best management practices,

The State Water Resources Control Board has recently revised the WDR fee structure for discharges of wastes to land in CCR Title 23, Division 3, Section 2200 (see “WATER NEWS” on the web at www.swrcb.ca.gov) . For discharges included in the Land Disposal Program, a TTWQ/CPLX ranking of “3-C” results in an annual fee of \$1,500.

The following summary information regarding burn-ash sites/dumps was developed using the experience of the Regional Board staff and information contained in the California Integrated Waste Board's (CIWMB's) Local Enforcement Agency (LEA) Advisory #56. The entire text of LEA Advisory #56 can be found on the web at:

<http://www.ciwmb.ca.gov/leaadvisory/56/Default.html>.

A. What Is a Burn Dump?

A burn dump is a site where solid waste has been burned at low temperature and the residual burn ash and debris have been landfilled or stockpiled. The "burn ash" referred to in this Staff Report is the residual ash that results from the low temperature combustion of solid waste. Ash from controlled incineration at a permitted facility, such as a waste-to-energy plant, is not included here. Burn dumps commonly contain little biodegradable organic material because of the combustion of waste materials and the age of the sites. As a result, little or no landfill gas is generated from residual wastes at historical "*burn dump*" sites.

Burn dumps were phased out in the early 1970s in response to federal and state air quality legislation. Most burn dumps are considered closed sites as their operations ceased prior to the development of regulations addressing the closure of waste disposal sites, provided that these sites were operated under applicable permits at the time. If these sites were not operated under applicable permits at the time they would be considered illegal disposal sites.

B. What Are the Problems and Hazards Associated with Burn Dumps?

An increasing number of burn dumps are identified in site assessments conducted by the LEAs and the California Integrated Waste Management Board (IWMB). Laboratory tests of burn-ash (wastes) from a number of burn dump sites indicate that the burning of nonhazardous household or municipal waste tends to concentrate certain metals to levels that may be considered hazardous under California regulations and, on occasion, federal regulations. The potential threat from burn ash to public health and safety and the environment may be minimal if the sites are located in remote, less populated areas of the state where public contact is limited or nonexistent. However, in heavily developed areas where land is scarce and expensive there is increasing interest in developing burn dump sites. Before a burn dump site is developed the associated health and environmental risks should be addressed through a waste characterization study. Test results indicate the predominant metals of concern in burn ash (*i.e.*, arsenic, beryllium, cadmium, chromium, copper, mercury, nickel, lead, and zinc) are not readily soluble in water under ambient conditions and not readily leachable into ground water.

However, burn ash does pose a risk if it becomes airborne, is eroded into surface water, or comes in contact with skin. The potential routes for human exposure to the contaminants in burn ash are inhalation, ingestion, and direct skin contact. Exposure to contaminants via any of these routes may result in adverse health effects. Potential hazards from burn-ash wastes result primarily from:

1. Improper cover contributing to burn-ash waste constituents becoming airborne and being inhaled by humans or animals.
2. Inadequate erosion protection contributing to transport of burn-ash waste constituents into surface waters and being ingested by humans and sensitive ecological receptors.
3. Improper site security allowing human or animal access to areas containing burn-ash wastes and exposure to burn-ash waste constituents from direct contact, inhalation, and ingestion.
4. Burn dumps not recorded at the local level allowing construction or other improper land use on or adjacent to burn-ash wastes/constituents and long term threats to public health and safety and the environment.

C. Statewide Burn Ash Characterization

A significant concern when evaluating a burn dump is determining whether or not the burn-ash waste constituents and residues are “hazardous wastes” pursuant to State and/or Federal criteria. To determine whether or not a burn ash is hazardous a burn ash characterization study (*i.e.*, waste characterization study) is performed. In a waste characterization study samples of burn ash are collected and analyzed using a specified sampling methodology and set of test protocols. Each test protocol produces its own specific type of information for a given range of conditions. The testing protocols focus on evaluating concentrations of metals (*e.g.*, Pb, Cu, Cr, etc.) and combustion products (*e.g.*, polynuclear aromatic hydrocarbons (PAHs) and in some cases furans and dioxins).

The burn ash wastes at burn dump sites in California may meet the criteria to be classified as a “California hazardous waste” (per California Code of Regulations, Title 22 (A.K.A. 22 CCR)). However, because of the limited solubility of burn ash metals in water, the risk posed by these sites is effectively controlled when a few straightforward precautions are taken.

D. Who Regulates Old Burn Dumps?

Regional Water Quality Control Board (Regional Board). The Regional Board has authority to regulate burn dumps regardless of whether the waste has been determined

to be hazardous or non-hazardous. The Regional Boards regulate discharges of wastes to land using State requirements contained in CCR Title 27 (for nonhazardous wastes) and CCR Title 23, Chapter 15 (for hazardous wastes). The agency's primary concern is the protection of water quality and the beneficial uses of water resources in the State.

Department of Toxic Substances Control (DTSC). If burn ash is classified as a RCRA hazardous waste DTSC is the lead agency and regulates the site in accordance with 22 CCR. If burn ash is classified as a California hazardous waste DTSC would normally be the lead agency and would regulate the site in accordance with 22 CCR. However, as discussed above, under some circumstances the authority to regulate burn dump sites is given to the LEA and IWMB. The agency's primary concern is risk management for the protection of human health.

California Integrated Waste Management Board (CIWMB)/ Local Enforcement Agency (LEA). The CIWMB believes that the authority that allows LEAs and the CIWMB to investigate and inspect burn dumps is contained in Public Resources Code (PRC) section 44100. Solid waste, as defined in PRC section 40191, does not include hazardous waste or low level radioactive waste regulated under Chapter 7.6 of the Health and Safety Code. When burn ash is classified as a RCRA hazardous waste the CIWMB and LEA do not have the authority to regulate the site, even if the waste was derived from solid waste. However, when burn ash is classified as a California hazardous waste there are circumstances where the CIWMB and LEA may regulate sites containing burn ash wastes.

In the event that the waste characterization study demonstrates that the ash does not meet the criteria for being classified as a California or RCRA hazardous waste, DTSC involvement in any site activity, including removal of ash, would not be necessary. If the waste characterization study demonstrates that the ash contains a non-ash California hazardous waste fraction DTSC should be contacted to determine how to proceed.

The CIWMB asserts that California Code of Regulations, Title 27 (27 CCR) section 21100(d) allows the Local Enforcement Agencies to apply closure regulations, on an as needed basis, to closed sites (including some burn ash sites) not having approved closure plans and to illegal or abandoned disposal sites. The agency's primary concern is the protection of human health.

E. Old Burn Dumps in the San Diego Region

Cal-EPA has convened a work group including the State Water Resources Control Board (SWRCB), Department of Toxic Substances Control (DTSC) and the Integrated Waste Management Board (CIWMB) to address various issues related to the management of wastes from burn-ash sites. Cal-EPA has compiled a list of 527 burn-ash sites statewide of which 53 sites are located within the San Diego Region.

Residual wastes associated with these sites commonly contain elevated and/or hazardous concentrations of metals (*e.g.*, lead, copper, chromium, *etc.*). Depending upon the site-specific location and nature of the wastes, the threat to water quality from these sites may be significant.

Reports from the City of San Diego Planning Commission (1938) and the San Diego Unified Port District (1994) document the occurrence of a number of historical waste burning operations located in the San Diego Region. From this information, it is clear that as the San Diego Region became more developed and urbanized, there were significant efforts made to develop and use more cost-effective means to process and dispose of municipal solid wastes. There are no reliable estimates for the total volume of solid wastes contained in historical burn-ash dumps located in the San Diego Region. However, the volume of burn-ash wastes located beneath the San Diego metropolitan and waterfront areas alone may include hundreds of thousands to millions of cubic yards.

Past Executive Officer Reports (*i.e.*, November 2001 to January 2003) have included summaries of activities of the Regional Board staff relating to the regulation of burn-ash sites in the San Diego Region. The Regional Board staff continues to work with the Local Enforcement Agencies (City and County LEAs) to effectively regulate old burn dumps in the San Diego Region.

CONCLUSION: The Regional Board staff conclude that it is effective to work with dischargers and other regulatory agencies to achieve a combination of accurate waste characterization; selective cleanup and abatement requirements; and effective implementation best management practices (BMPs) to manage residual burn-ash wastes in the San Diego Region. The effective integration of these efforts will result in the most cost-effective approach to mitigating long-term threats of pollution or nuisance that may be associated with residual “burn-ash” wastes located in the San Diego Region. The Regional Board staff have developed General Waste Discharge Requirements (General WDRs) for the effective management of residual “burn-ash” wastes where it is determined to be technically or economically infeasible to completely remove and dispose of burn-ash wastes at a Classified waste management unit (landfill).

4. GENERAL PERMITTING

The Regional Board staff believes that landfills containing insignificant quantities of decomposable wastes, which became inactive, closed or abandoned prior to November 1984, are more appropriately regulated under General Waste Discharge Requirements than Individual Waste Discharge Requirements because:

- A. Those past discharger were generally produced by similar waste management operations conducted within the San Diego Region.

- B. Those past discharges involved similar waste streams collected within the San Diego Region.
- C. Those past discharges were subject to similar treatment standards within the San Diego Region.
- D. Most pre-1984 landfills and burn dumps have similar types of monitoring and maintenance requirements for the effective protection of water quality and the prevention of nuisance conditions.

On April 9, 1997, the California Regional Water Quality Control Board, San Diego Region (Regional Board) adopted Order No. 97-11: "*General Waste Discharge Requirements for Post-Closure Maintenance of Inactive Nonhazardous Waste Landfills within the San Diego Region.*" These WDRs established post-closure maintenance, and monitoring and reporting requirements in accordance with CCR Title 27. On June 14, 2000, the Regional Board adopted Addendum No. 1 to Order No. 97-11. Addendum No. 1 updated general maintenance requirements and identified additional WMUs that would more appropriately be regulated under general waste discharge requirements than individual waste discharge requirements.

General WDRs allow the Regional Board to more effectively and efficiently regulate the post-closure maintenance of inactive landfills within the San Diego Region. General WDRs reduce the amount of staff time extended on preparing and considering individual waste discharge requirements for each project. The collection of a filing fee will help cover the cost of administering the General WDRs. Tentative Order R9-2003-0002 will supercede the current waste discharge requirements (Order No. 97-11 and addenda thereto) for the landfills and burn dumps listed on Attachment No. 1 of the tentative Order.

5. CLASSIFICATION OF SOLID WASTES AND DISPOSAL UNITS

The California Water Code gives the California Regional Water Quality Control Boards authority to protect the quality of water resources within their Regions. Discharges of nonhazardous wastes to land are regulated under CCR Title 27. This body of regulations prescribes the criteria used by the Regional Boards to classify wastes based upon its threat to water quality and a site based upon the level of protection afforded to water quality. The threat to water quality posed by a particular disposal activity depends upon a site-specific combination of waste and site characteristics.

Waste Classification. California Code of Regulations (CCR), Title 27 classifies wastes as hazardous, designated, nonhazardous solid waste, or inert waste. Municipal solid wastes are classified as nonhazardous wastes per the criteria listed in CCR Title 27, §20220(a), and typically contains putrescible and nonputrescible solid, semi-solid, and liquid wastes.

A nonhazardous waste is defined as: “all putrescible and nonputrescible solid, semi-solid and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, manure, vegetable or animal solid and semi-solid wastes and other discarded waste (whether of solid or semi-solid consistency); provided that such wastes do not contain wastes which must be managed as hazardous wastes, or wastes which contain soluble pollutants in concentrations which exceed applicable water quality objectives, or could cause degradation of waters of the state (i.e., designated waste).” [CCR Title 27 §20220(a)].

A designated waste is defined as: “Nonhazardous waste that consists of, or contains, pollutants that, under ambient environmental conditions at a waste management unit, could be released in concentrations exceeding applicable water quality objectives or that could reasonable be expected to affect beneficial uses of the waters of the state as contained in the appropriate state water quality control plan.” [CWC 13173(b)].

Waste Management Unit Classification. CCR Title 27 contains criteria whereby waste management units (“WMUs”) are classified according to their ability to protect surface and ground water resources by effectively containing wastes discharged into the WMU. Nonhazardous municipal solid wastes (MSWs) are disposed of in “Class III WMUs”.

Historical discharges of “*burn-ash*” wastes typically contain insignificant quantities of decomposable wastes and are the result of the open burning of wastes/refuse, after which the residual materials were buried in “landfills”.

6. REGULATORY LIMITS

To characterize burn ash, Regional Board staff commonly rely upon results from sampling protocols (“*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, U.S. Environmental Protection Agency*”) and the regulatory limits established from the California Code of Regulations, Title 22, Section 66261.10 *et seq.* and the Code of Federal Regulations, Title 40, Section 261.24. It is important to make the connection between the sampling protocol (for waste characterization) and the regulatory criteria cited above. Commonly, a suite of samples must be collected to properly characterize the compositional heterogeneity that is associated with deposits/discharges of burn ash wastes. Analytical results from a single sample may not indicate that the “entire waste deposit” is properly characterized as hazardous waste under the State or Federal requirements.

The sample results are compared to the TTLC and STLC, and the Federal RCRA Standards. This comparison provides the basis for classifying the burn ash as either a RCRA hazardous waste, a non-RCRA hazardous waste (designated a California hazardous waste), or a non-hazardous solid waste. Burn-ash wastes may be classified as a California hazardous waste when concentrations of waste constituents exceed the total

threshold limit concentration (or TTLC) or soluble threshold limit concentration (or STLC) limits as defined in Title 22, California Code of Regulations (CCR). In addition, wastes that exceed the federal toxicity characteristic leaching potential (or TCLP) concentration limits would be considered a RCRA hazardous waste.

7. TESTING PROTOCOLS

In a waste characterization study, burn ash samples are analyzed using one or more test protocols. Each test protocol produces its own specific type of information for a given range of conditions. The CIWMB reports that four test protocols are widely used, including:

Protocol 1: Totals Test. The “totals test” is a chemical digestion test developed by the department of Toxics Substances Control (DTSC) to determine the total amount of a specific constituent in the soil. A sample is digested chemically to obtain its soluble and insoluble fractions. The total of the soluble and insoluble fractions of the sample is then compared to the total threshold limit concentration (TTLC). The results of the Totals Test are reports in milligrams per kilogram of sample (mg/kg).

Protocol 2: Waste Extraction Test (WET). The WET is a leaching test developed by DTSC. The results of the WET are compared to the soluble threshold limit concentration (STLC). The WET determines the amount of a specific constituent that can be leached from the soil using a solution designed to simulate landfill leaching. It is therefore a useful test for situations where a soil would be exposed to landfill leachate, such as disposal of ash together with uncombusted organic wastes in a solid waste landfill. However, the WET may not be very representative of the conditions at a site where all organic material has been completely burned. Because of the aggressive nature of the leaching in this test, samples may exceed the STLC. The results of the WET are reported in milligrams per liter (mg/l).

Protocol 3: Toxicity Characteristics Leaching Procedure (TCLP). The TCLP was developed by the U.S. Environmental protection Agency (EPA) to determine if a waste is a RCRA hazardous waste subject to regulation under Federal hazardous waste requirements (Subtitle C). the TCLP is a leaching procedure that uses a slightly less aggressive leaching agent than is used by the WET. The TCLP ensures that any volatile constituents present in the sample are collected and measured. However, few volatile constituents are likely to be found in completely combusted burn ash. Therefore, when compared to the WET results, it is likely that TCLP results will indicate lower metals concentrations and less elevated levels of volatile constituents. Chromium is one of the few constituents that may be present in higher concentrations in TCLP results than in WET results. Chromium concentrations are higher because the TCLP results do not differentiate between the Cr^{3+} and Cr^{6+} chrome species, but report the two species combined. In contrast, the WET reports the Cr^{3+} and Cr^{6+} species separately. The results of the TCLP are reported in milligrams per liter (mg/L). Temperatures reached during

open burning are usually not high enough to completely combust all waste materials in the burn ash. Therefore, in some cases, combustion of MSW may create polynuclear aromatic hydrocarbons (PAHs), furans, dioxins, and/or other organic compounds.

Protocol 4: Deionized Water Waste Extraction Test (DI WET). The DI WET may be used to characterize the amount of metals that would leach from ash under the conditions most likely to be encountered at burn dump sites. This test is essentially the same test as the WET, but uses deionized water as the leaching agent. At most burn dump sites the primary liquid that will come in contact with burn ash is water, not landfill leachate. Results of tests done of samples of burn ash from a variety of burn dump sites indicate that very few samples release any metals when tested under the DI WET protocol.

The U.S. EPA has also established a formal protocol using water to assess leachability of waste constituents from burn ash under ambient conditions at the site. This protocol is a variation on Protocol 4 (above) known as the Synthetic Precipitation leaching Procedure (SPLP: EPA Method 1312).

8. ANALYTICAL PROCEDURES

Typically, all samples are analyzed for California Assessment Manual (CAM) 17 metals using the Totals Test procedure by EPA Method 6010/7000 and pH by EPA Method 9040. Samples (i.e., at least three) with the highest concentration of lead based on the Totals Test are also analyzed for CAM-5 metals using the WET procedure and RCRA Eight Metals using the TCLP. Also, if the WET results for any other metal not in the CAM-5 analysis exceeds 10 times the STLC regulatory level, a separate WET analysis for that metal is typically performed.

In addition, the CIWMB recommends using the samples containing the highest concentration of lead for further analysis for lead using the DI WET extraction procedure. Sampling for polychlorinated biphenyls (or PCBs), total recoverable petroleum hydrocarbons (TRPH), and semi-volatile organic compounds may be necessary if site specific observations or records indicate the presence of those waste constituents.

At a minimum, the CIWMB staff recommends all soil/ash/waste samples be analyzed for the following constituents:

- CAM 17 Metals (*Sb, As, Ba, Be, Ce, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Ag, Tl, V, Zn*) Totals Test, EPA Method 6010B/6020/7471A {method references updated by Regional Board staff}
- pH, EPA Method 9045C {method reference updated by Regional Board staff}

And the three samples containing the highest lead be analyzed for:

- CAM 5 Metals (*Cd, Cr, Ni, Pb, Zn*), *WET, EPA Method 6010B/6020 {method references updated by Regional Board staff}*
- TCLP RCRA Metals (*Ag, As, Ba, Cd, Cr, Hg, Pb, Se*), *EPA Method 1311*

Additionally, agency staff may request the following sampling procedures:

- PCBs, *EPA method 8082 {method references updated by Regional Board staff}*
- Total Recoverable Petroleum Hydrocarbons (TRPH), *EPA Method 418.1*
- Semi-Volatile Organic Compounds, *EPA Method 8270C {method reference updated by Regional Board staff}*
- Lead DI-WET, *WET, EPA Method 6010B/6020 {EPA Method 1312 SPLP could also be used in place of the DI-WET, method references updated by Regional Board staff}*

Additional testing for dioxins and furans (EPA Method 8290) may be appropriate if evidence suggests that these waste constituents would: a) likely be present from the type of waste combusted, and/or b) the site is located in an area with a number of sensitive receptors nearby and where there is a higher risk to human health or the environment.

9. DISCHARGE SPECIFICATIONS

Tentative Order No R9-2003-0002 establishes waste discharge requirements for unlined, nonhazardous waste landfills which were inactive, closed, or abandoned before November, 1984. Most of the facilities listed under this tentative order overlie ground water basins designated as suitable for use as municipal and domestic public water supplies. Applicable numeric and narrative water quality objectives for groundwater resources are promulgated in Chapter 3 of the Water Quality Control Plan for the San Diego Region. Additional State water quality criteria for protection of beneficial uses of water as a source of public drinking water supply are promulgated in CCR Title 22, Division 4, Chapter 15, Article 4: §64431 (Primary MCLs for inorganic chemicals), §64444 (Primary MCLs for organic chemicals), §64449 (Secondary MCLs), and Chapter 17.5, Article 1, §64672.3 (copper and lead action levels).

Some of these facilities are also in areas located in proximity to surface waters that support beneficial uses including recreation (REC1 and REC2), and support fish and wildlife (COLD, WARM, WILD, and RARE). Further, a number of impaired water bodies have been identified in the San Diego Region and listed on the statewide 303-d list. Updated conditions and controls have been added to tentative Order No. R9-2003-

0002 to help ensure that the dischargers will implement adequate best management practices (BMPs) for storm water conveyance and the control of erosion, to preclude the discharges of sediment, wastes, or runoff from the site into impaired water bodies. Applicable numeric and narrative water quality objectives for surface water resources are promulgated in Chapter 3 of the Water Quality Control Plan for the San Diego Region. Additional State and Federal water quality criteria for the protection of beneficial uses of surface water resources are promulgated by the U.S. Environmental Protection Agency as the California Toxics Rule (CTR) as implemented by State Water Resources Control Board Resolution Nos. 2000-015 and 2000-030.

10. GENERAL MAINTENANCE REQUIREMENTS

Tentative Order R9-2003-0002 requires the dischargers to perform regular maintenance of the landfill cover systems throughout the post-closure maintenance period. The post-closure maintenance period continues until the Regional Board determines that the remaining wastes in the Waste Management Unit (WMU) no longer pose a threat to water quality.

Interim landfill covers must be designed to prevent ponding, infiltration and to resist erosion under anticipated runoff events (California Code of Regulations (CCR) Title 27, Chapter 3, Subchapter 4, Article 2 Section 20705). In order to monitor the performance of the interim cover systems at landfills and burn dumps which were closed, abandoned or inactive prior to 1984, dischargers shall periodically perform a technical assessment to evaluate the effectiveness of the interim landfill cover system. The thickness of the interim landfill cover system (including the top deck, intermediate benches, and sideslopes) shall be measured at least every five years.

11. EROSION AND STORMWATER PROTECTION

One of the primary threats to water quality from landfills containing insignificant volumes of decomposable wastes is from erosion and transport to surface water resources. In order to protect water quality, Waste Management Units (WMUs) must be adequately protected against washout, erosion of wastes, or the erosion of cover materials.

A variety of approaches may be taken to implement effective Best Management Practices (BMPs) for the long-term control of surface water runoff and erosion of the landfill cover. Implementation of adequate BMPs for effective storm water conveyance and erosion control are essential for the protection of surface water resources and the restoration of impaired water bodies located within the San Diego Region. Effective BMPs are best designed and implemented on a site-specific basis.

Annually, prior to the rainy season, but no later than October 31, the discharger for each facility shall implement any necessary erosion control measures, and shall complete any

necessary construction, maintenance, or repairs of precipitation and drainage control facilities to prevent erosion, ponding, flooding, or to prevent surface drainage from contacting or percolating through wastes. This requirement does not preclude the dischargers from performing regular site maintenance and repairs necessitated by changing site conditions throughout the year.

All landfills and burn dumps regulated under this tentative Order shall comply with the storm water and erosion control requirement of Order 97-03-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000001, "Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities."

12. TEMPORARY STOCKPILE MANAGEMENT

In conforming with the requirements to perform regular maintenance of the landfill cover system throughout the post-closure maintenance period, the discharger may find it necessary to create temporary stockpiles of soil prior to conducting grading operations. Soil stockpiles shall be placed in designated areas that are clearly identified at the site, and labeled on figures in semi-annual reports submitted to the Regional Board.

Any soil imported to an inactive landfill site for general maintenance must be stockpiled on a temporary basis only. The source(s), including name and address of the supplier, address of the source location, and the volume of soil provided from that source, of all imported materials shall be provided to the Regional Board. Stockpiles must be regularly inspected and maintained to ensure the discharge of soils do not create a condition of pollution or nuisance.

Tentative Order R9-2003-0002 establishes waste discharge requirements for management of on-site temporary soil stockpiles. Effective BMPs shall be established to prevent surface water run-on and the erosion and transport of soils by surface water runoff. To help control erosion by storm water, fugitive dust and other nuisances, stockpiles shall be overlain by plastic sheeting not less than 10 mils thick or implementation of a BMP that offers an equivalent level of protection.. All stockpiles shall be located greater than 100 feet away from any surface water identified in the Basin Plan, and must be protected against 100-year peak stream flows as defined by the local County flood control agency.

13. ENROLLMENT PROCEDURES

The enrollment procedure for a facility into the WDR program includes the submittal of an application, an RWD and supporting information, and a filing fee. In order to enroll for coverage under tentative Order R9-2003-0002, the discharger submits the a complete Report of Waste Discharge (RWD), including the following minimum information:

- A. Form 200, Application for Facility Permit/Waste Discharge, filled out in accordance with the instructions, and a filing fee of \$1,500 payable to the State Water Resources Control Board.

The enrollment fee is based upon the assigned threat to water quality (TTWQ) and complexity rating (CPLX) established pursuant to criteria in CCR Title 23, §2200. The Regional Board staff has assigned a TTWQ/CPLX rating of “III-C” for dischargers covered under tentative Order No. R9-2003-0002. This rating is appropriate for discharges of waste requiring implementation of groundwater monitoring and BMPs because of the potential impact to the quality of waters of the State. Under the current fee schedule in CCR Title 23 §2200, a TTWQ/CPLX rating of III-C requires the discharger submit a filing fee of \$1,500 payable to the State Water Resources Control Board (SWRCB).

- B. Copies of all analytical results, associated laboratory data sheets, including QA/QC data and chain of custody documents.
- C. A discussion of the landfill and waste characteristics including:
- 1) Identification of the period during which waste was disposed of at the site;
 - 2) Description of landfill disposal methods, operation and maintenance activities;
 - 3) Description of types and quantities of waste disposed of;
 - 4) Identification of the total volume of waste disposed of at the site;
 - 5) Any closure or post-closure activities conducted at the landfill subsequent to ceasing operation; and
 - 6) Present and future land use of the inactive landfill.
- D. Documentation of how the discharger will comply with all applicable requirements of Order and Monitoring and Reporting Program No. R9-2003-0002.
- E. A topographical scale map showing the location, users and uses of all wells located within one mile of the inactive landfill.
- F. The discharger shall file a Notice of Intent (NOI) and application fee for coverage under State Board Order No. 97-03-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000001, “Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities.”

- G. A Storm Water Pollution Prevention Plan (SWPPP) or an updated version thereof, as required by Order 97-03-DWQ.
- H. Any other information pertinent to the protection of water quality or public health and prevention of nuisance.

Qualified inactive waste management units may also be enrolled in this tentative Order through the procedure described above, or by the Regional Board under the statutory authority of the California Water Code §13263(d). In either case, the discharger will receive written notification from the Regional Board stating whether or not it is appropriate to regulate the inactive landfill in question under these general WDRs, or if individual WDRs are required.

14. REPORTING REQUIREMENTS

The discharger is required to comply with the following minimum reporting requirements:

- A. The discharger shall file a new Report of Waste Discharge **at least 120 days** prior to the following:
 - 1) Significant change in post-closure maintenance activities that would significantly later existing drainage patterns and slope configurations, or pose a potential threat to the integrity of the site;
 - 2) Change in land use other than as described in the finds of tentative Order No. R9-2003-0002;
 - 3) Significant change in disposal area, e.g., excavation and relocation of waste on site; or
 - 4) Any planned change in the regulated facility or activity which results in noncompliance with this tentative Order.
- B. The discharger shall submit a workplan **at least 30 days** prior to any maintenance activities that could alter existing surface drainage patterns or change existing slope configurations. These activities may include, but not be limited to, significant grading activities, the importation of fill material, the design and installation of soil borings, ground water monitoring wells and other devices for site investigation purposes.
- C. **Within six months** of adoption of this Order, or enrollment therein, the discharger shall submit to the Regional Board a current or updated cover maintenance plan. The cover maintenance plan shall include a description of how the discharger plans to

comply with the general maintenance requirements specified in CCR Title 27 §21090(c)(1), §21090(c)(3), §21090(c)(4), and §21090(c)(5), as well as the conditions listed in **Post-Closure Maintenance Specifications C.1.a-h** of tentative Order No. R9-2003-0002.

- D. The discharger shall provide written notification **at least 2 working days** prior to any maintenance activities that are minor and/or routine in nature, do not add a significant amount of water, do not inhibit drainage, have limited potential for impacts to beneficial uses of water, and will not interfere with future routine maintenance. These activities may include, but not be limited to:
- 1) Routine maintenance grading and dust control;
 - 2) Landscaping with minimal/no water application;
 - 3) Gas surveys with temporary probes; or
 - 4) Replacement/removal of gas collection wells.
- E. Furnish, within a reasonable time, any information the Regional Board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order. The discharger shall also furnish, upon request by the Regional Board Executive Officer, copies of records required to be kept under this Order.
- F. The Regional Board shall be notified immediately of any slope failure occurring in a waste management unit. The discharger shall promptly repair any failure that threatens the integrity of the containment systems. A written summary of actions that were implemented to correct any slope failures shall be prepared and submitted with the next monitoring report.
- G. The Regional Board shall be notified immediately by telephone of the discovery of any previously unreported seepage from the disposal area. A written report shall be filed with the Regional Board within **seven days** containing at least the following information:
- 1) A map showing the location(s) of the seepage;
 - 2) An estimate of the flow rate;
 - 3) A description of the nature of the discharge (*e.g.*, all pertinent observations and analyses); and
 - 4) Corrective measures approved (or proposed for consideration) by the Regional Board.

The discharger shall notify the Regional Board, in writing, at least **30 days** in advance of any proposed transfer of this Order's responsibility and coverage between the current owner and new owner for construction, operation, closure, or post-closure maintenance of a landfill. This agreement shall include an acknowledgement that the existing owner is liable for violations up to the transfer date and that the new owner is liable from the transfer date on. The agreement shall include an acknowledgement that the new owners shall accept responsibility for compliance with this Order that includes the post-closure maintenance of the landfill.

The discharger is required to report any noncompliance, which may endanger human health or the environment. Any such information shall be provided orally to the Regional Board **within 24 hours** from the time the owner becomes aware of the circumstances. A written submission shall also be provided **within five days** of the time the owner becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected; the anticipated time it is expected to continue, and steps taken or planned to reduce, eliminate, or prevent recurrence of the noncompliance. The Regional Board, or an authorized representative, may waive the written report on a case-by-case basis, if the oral report has been received within 24-hours.

At any point in time, failure to comply with the requirements of tentative Order No. R9-2003-0002 will result in the Regional Board staff developing enforcement actions against the discharger in accordance with the SWRCB's Enforcement Policy (2002).

15. COMPLIANCE WITH CEQA

Inactive landfills and burn dumps are existing facilities and, as such, regulatory actions related to inactive facilities are exempt from the provisions of the California Environmental Quality Act in accordance with the California Code of Regulations, Title 14, Chapter 3, Article 19, §15301.

16. FINANCIAL ASSURANCES

General Order 97-11 (and addenda thereto) does not include provisions for dischargers to obtain and maintain acceptable assurances of financial responsibility. The Regional Board staff intends to correct that deficiency by developing and addendum to Order 97-11 for consideration by the Regional Board as a future agenda item.

Pre-1984 waste management units are existing reservoirs of solid wastes, waste constituents, and degradation products derived from those wastes. A release of wastes, waste constituents or degradation products derived therefrom may create a condition of pollution or nuisance as defined under Water Section 13050. In order to minimize that

threat, it is necessary to implement regular activities associated with post-closure maintenance activities and monitoring. In the event of a release of wastes, waste constituents or degradation products from the waste management unit; implementation of corrective actions may also be necessary to protect the quality of the waters of the State. It is not the intent of the State to take on financial responsibility for implementing post-closure maintenance, monitoring, or corrective actions at waste management units that either closed or became inactive prior to 1984. The financial responsibility for implementing the necessary post-closure maintenance, monitoring, and corrective actions are the responsibility of the dischargers (owners) of pre-1984 waste management units.

The State Regulatory requirements for dischargers to obtain and maintain assurances of financial responsibility have been part of state regulatory requirements covering landfills for some time [also see CCR Title 23, Chapter 15, § 2550(b)]. Examples of current State requirements for dischargers to provide Financial Assurances, specifically naming the Regional Board as the beneficiary, may be found in CCR Title 27, §20380(a), §22212(a) and §22222. Tentative Order R9-2003-0001 contains a requirement for dischargers to obtain and maintain assurances of financial responsibility for the enrolled facilities.

17. STAFF RECOMMENDATIONS

The Regional Board staff recommends adoption of tentative Order No. R9-2003-0002 and tentative Monitoring and Reporting Program R9-2003-0002.

REFERENCES CITED

California Integrated Waste Management Board (CIWMB), 1998, “*LEA Advisory #56- Process for Evaluating and Remediating Burn Dump Sites*”, **dated November 4, 1998**. Available from the CIWMB web site at:
<http://www.ciwmb.ca.gov/leaadvisory/56/Default.htm>.

City of San Diego Planning Commission, 1938, “Report of Refuse Dumps”, dated January 31, 1938.

San Diego Unified Port District, 1994, “*A Historical Perspective of the Eighth Avenue Tidelands Dump*”, dated September 1994.

State Water Resources Control Board (SWRCB), 2003, “Land Disposal Program – SWAT Program”, on the web at:
<http://www.swrcb.ca.gov/cwphome/land/landu/intErnet/swat.htm>

Tchobanoglous, G., H. Theisen ,ad S. Vigil, 1993, Integrated Solid Waste Management: Engineering Principles and Management Issues, New York: Irwin McGraw Hill, 978p.